

RESPONSE TO OFFICE ACTION

Serial No. 10/674,631

Page 2 of 12

IN THE CLAIMS

1. (Currently Amended) A method for determining the endpoint of an etch process, comprising:

(a) providing a substrate comprising a material layer having an initial thickness, wherein the material layer is a high-k dielectric material layer;

(b) etching the material layer on the substrate;

(c) directing radiation onto the substrate as the material layer is etched, ~~where the radiation has a wavelength that is on the order of the thickness of the material layer;~~

(d) measuring a change in intensity for radiation reflected from the substrate at a pre-selected wavelength as the material layer is etched, wherein the pre-selected wavelength in nanometers is greater than or on the order of the initial thickness of the material layer in Angstroms; and

(e) terminating the etch step upon measuring a predetermined metric for the change in intensity of radiation reflected from the substrate at the pre-selected wavelength.

2. (Original) The method of claim 1 wherein the radiation has a wavelength within a range from about 200 to 800 nm onto the substrate.

3. (Original) The method of claim 1 wherein the thickness of the material layer is 5 to 300 Angstroms.

4. (Original) The method of claim 1 wherein the thickness of the material layer is less than or equal to the wavelength of the radiation.

5. (Original) The method of claim 1 wherein step (c) comprises:
directing the radiation substantially perpendicular to the material layer; and
modulating the intensity of the directed radiation.

27289_1

RESPONSE TO OFFICE ACTION

Serial No. 10/674,631

Page 3 of 12

6. (Original) The method of claim 1 wherein step (d) comprises:
filtering wavelengths other than the pre-selected wavelength.
7. (Original) The method of claim 1 wherein the predetermined metric is associated with measuring a predetermined change in intensity for the reflected radiation at the pre-selected wavelength.
8. (Original) The method of claim 1 wherein the predetermined metric is associated with measuring a substantially constant intensity for the reflected radiation as a function of time at the pre-selected wavelength.
9. (Original) The method of claim 7 wherein measuring the predetermined change of intensity for the reflected radiation is associated with removal of the material layer from the substrate.
10. (Original) The method of claim 8 wherein measuring the substantially constant intensity for the reflected radiation as a function of time is associated with removal of the material layer from the substrate.
11. (Currently Amended) A method for determining the endpoint for etching a gate dielectric layer of a transistor, comprising:
- (a) providing a substrate comprising a gate dielectric layer having an initial thickness, wherein the gate dielectric layer is a high-k gate dielectric layer;
 - (b) etching the gate dielectric layer on the substrate;
 - (c) directing radiation onto the substrate as the gate dielectric layer is etched, ~~where the radiation has a wavelength that is on the order of the thickness of the gate dielectric layer;~~
 - (d) measuring a change in intensity for radiation reflected from the substrate at a pre-selected wavelength as the gate dielectric layer is etched, wherein the pre-selected wavelength in nanometers is greater than or on the order of the initial thickness of the gate dielectric layer in Angstroms; and

27289_1

RESPONSE TO OFFICE ACTION**Serial No. 10/674,631****Page 4 of 12**

(e) terminating the etch step upon measuring a predetermined metric for the change in intensity of radiation reflected from the substrate at the pre-selected wavelength.

12. (Original) The method of claim 11 wherein the thickness of the gate dielectric layer is less than or equal to the wavelength of the radiation.

13. (Original) The method of claim 11 wherein the gate dielectric layer comprises at least one film of hafnium dioxide (HfO_2) and hafnium silicate (HfSiO_2).

14. (Original) The method of claim 11 wherein the thickness of the gate dielectric layer is about 5 to 300 Angstroms.

15. (Original) The method of claim 11 wherein step (c) comprises:
directing radiation having wavelengths within a range from about 200 to 800 nm onto the substrate.

16. (Original) The method of claim 11 wherein step (c) comprises:
directing the radiation substantially perpendicular to the gate dielectric layer, and
modulating the intensity of the directed radiation.

17. (Original) The method of claim 11 wherein step (d) comprises:
filtering wavelengths other than the pre-selected wavelength.

18. (Original) The method of claim 11 wherein the predetermined metric is associated with measuring a predetermined change in intensity for the reflected radiation at the pre-selected wavelength.

19. (Original) The method of claim 11 wherein the predetermined metric is associated with measuring a substantially constant intensity for the reflected radiation as a function of time at the pre-selected wavelength.

27289_1

RESPONSE TO OFFICE ACTION**Serial No. 10/674,631****Page 5 of 12**

20. (Original) The method of claim 18 wherein measuring the predetermined change of intensity for the reflected radiation is associated with removal of the gate dielectric layer from the substrate.

21. (Original) The method of claim 20 wherein measuring the substantially constant intensity for the reflected radiation as a function of time is associated with removal of the gate dielectric layer from the substrate.

22-31. (Cancelled)

32. (Withdrawn – Currently Amended) A computer-readable medium containing software that, when executed by a computer, causes a processing system to detect an endpoint of an etch process using a method, comprising:

(a) providing a substrate comprising a material layer having an initial thickness, wherein the material layer is a high-k dielectric material layer;

(b) etching the material layer on the substrate;

(c) directing radiation onto the substrate as the material layer is etched, ~~where the radiation has a wavelength that is on the order of the thickness of the material layer;~~

(d) measuring a change in intensity for radiation reflected from the substrate at a pre-selected wavelength as the material layer is etched, wherein the pre-selected wavelength in nanometers is greater than or on the order of the initial thickness of the material layer in Angstroms; and

(e) terminating the etch step upon measuring a predetermined metric for the change in intensity of radiation reflected from the substrate at the pre-selected wavelength.

33. (Withdrawn) The computer-readable medium of claim 32 wherein step (c) comprises:

directing radiation having wavelengths within a range from about 200 to 800 nm onto the substrate.

27289_1

RESPONSE TO OFFICE ACTION
Serial No. 10/674,631
Page 6 of 12

34. (Withdrawn) The computer-readable medium of claim 32 wherein the thickness of the material layer is 5 to 300 Angstroms.

35. (Withdrawn) The computer-readable medium of claim 32 wherein the thickness of the material layer is less than or equal to the wavelength of the radiation.

36. (Withdrawn) The computer-readable medium of claim 32 wherein step (c) comprises:

directing the radiation substantially perpendicular to the material layer; and
modulating the intensity of the directed radiation.

37. (Withdrawn) The computer-readable medium of claim 32 wherein step (d) comprises:

filtering wavelengths other than the pre-selected wavelength.

38. (Withdrawn) The computer-readable medium of claim 32 wherein the predetermined metric is associated with measuring a predetermined change in intensity for the reflected radiation at the pre-selected wavelength.

39. (Withdrawn) The computer-readable medium of claim 32 wherein the predetermined metric is associated with measuring a substantially constant intensity for the reflected radiation as a function of time at the pre-selected wavelength.

40. (Withdrawn) The computer-readable medium of claim 38 wherein measuring the predetermined change of intensity for the reflected radiation is associated with removal of the material layer from the substrate.

41. (Withdrawn) The computer-readable medium of claim 39 wherein measuring the substantially constant intensity for the reflected radiation as a function of time is associated with removal of the material layer from the substrate.

RESPONSE TO OFFICE ACTION
Serial No. 10/674,631
Page 7 of 12

42. (New) The method of claim 1 wherein the thickness of the material layer is 20 to 100 Angstroms.

43. (New) The method of claim 11 wherein the thickness of the gate dielectric layer is 20 to 100 Angstroms.